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PATENT

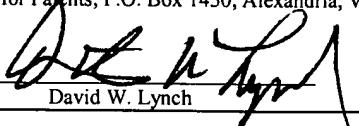
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: FLYNN JR et al. Examiner: Bonura, T.
Serial No.: 09/687,335 Group Art Unit: 2114
Filed: October 13, 2000 Docket No. SJO9-2000-0174US1
(IBMS.029US01)

Title:

METHOD AND APPARATUS FOR PROVIDING MULTI-PATH I/O IN NON-CONCURRENT CLUSTERING ENVIRONMENT USING SCSI-3 PERSISTENT RESERVE

CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence and the papers, as described hereinabove, are being deposited in the United States Postal Service in triplicate, as first class mail, in an envelope addressed to: Mail Stop Appeal Brief – Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on August 4, 2004.

By: 
David W. Lynch

APPELLANT'S BRIEF ON APPEAL

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Dear Sir:

This Brief is presented in support of the Appeal filed June 4, 2004, from the final rejection of Claims 1-38 of the above -identified application, as set forth in the Office Action mailed February 4, 2004.

Please charge Deposit Account No. 50-0996 (IBMS.029US01) in the amount of \$330.00 for the filing of the Appellant's Appeal Brief. Authorization is also given to charge/credit Deposit Account No. 50-0996 (IBMS.002PA) for any deficiencies/overpayments.

An original and two copies of the Brief are enclosed herewith.

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I. REAL PARTY OF INTEREST

The Real Party of Interest is International Business Machines Corporation, a corporation of New York.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences for the above-referenced patent application.

III. STATUS OF CLAIMS

Claims 1-38 are pending and are the subject of this Appeal (Appendix 1, Claims).

IV. STATUS OF AMENDMENTS

An initial Office Action was mailed on July 7, 2003. An Amendment in response to the initial Office Action was mailed on October 7, 2003. A final Office Action was mailed on February 4, 2004. A response to the final Office Action was filed on April 28, 2004, under 37 C.F.R. § 1.116. By way of Advisory Action mailed April 13, 2004, the May 12, 2004 response was not entered into the record and was deemed to not place the application in condition for allowance.

V. SUMMARY OF THE INVENTION

The present invention is directed to a method and apparatus for providing multi-path I/O in non-concurrent clustering environment. Open options of the operating system are mapped to SCSI persistent reserve commands to allow all of the multiple paths to register with the logical unit number of the shared storage systems and to allow the second of the multiple paths to access the logical unit number of the shared storage system after obtaining a persistent reservation with the shared storage system.

VI. ISSUES PRESENTED FOR REVIEW

Issue 1:

Whether claims 1 and 2 are patentable under § 102(b) in view of Marks et al. (U.S. Patent No. 5,790,775).

Issue 2:

Whether claims 23, 24, 26-27, 29, 31, 32, 34-35, and 37 are patentable under § 102(a) in view of IBM's SCSI Command Reference manual.

Issue 3:

Whether claims 3, 4, and 6 are patentable under § 103(a) in view of Marks as applied to claim 1 above, and further in view of IBM's SCSI Command Reference manual.

Issue 4:

Whether claims 3, 4, and 6 are patentable under § 103(a) in view of Marks as applied to claim 1 above, and further in view of IBM's SCSI Command Reference manual.

VII. GROUPING OF CLAIMS

For the purposes of the present appeal, in considering the rejections of the claims as outlined above, please group the claims as follows:

Group 1: Claim 1;

Group 2: Claim 2

Group 3: Claims 3-4, 6;

Group 4: Claims 23, 26-27, 29, 31, 34-35, and 37; and

Group 5: Claims 24 and 32.

VIII. ARGUMENT

1. CLAIM 1 IS PATENTABLE UNDER § 102(b) IN VIEW OF MARKS ET AL. (U.S. PATENT NO. 5,790,775)

Claim 1 requires “mapping open options of the operating system to SCSI persistent reserve commands to allow all of the multiple paths to register with the logical unit number of the shared storage system and to allow system; and allowing the second of the multiple paths to access the logical unit number of the shared storage system after obtaining a persistent reservation with the shared storage system.” Thus, the present invention uses SCSI-3 persistent reservation to provide multi-path I/O in a non-concurrent clustering path. Persistent reservations were first implemented in SCSI-3 applications.

Marks, unlike the instant application, focuses on SCSI and SCSI-2 applications, whereas SCSI persistent reservations are an aspect of SCSI-3 applications. Marks does not even mention the use of SCSI-3 or persistent reservations. Although Marks indicates that the invention is not limited to SCSI or SCSI-2 applications, Marks does not suggest anything concerning SCSI-3 or persistent reservations. Moreover, Marks does not discuss mapping

open options of the operating system to SCSI persistent reserve commands. In fact, Marks does not mention mapping at all. Rather, Marks merely discusses interconnecting devices with controllers on the device side of the SCSI bus and identifying the devices by a SCSI bus address.

While SCSI and SCSI-2 included the concept of reservation capabilities, Marks does not discuss any type of reservation, even those related to SCSI or SCSI-2 applications. Marks does not even teach, disclose or suggest more primitive reservations. Therefore, even related advancements in view of Marks cannot teach, disclose or suggest “mapping open options of the operating system to SCSI persistent reserve commands to allow all of the multiple paths to register with the logical unit number of the shared storage system.” Thus, persistent reservations cannot be included in implementations set forth in Marks.

Marks also does not teach, disclose or suggest “mapping open options of the operating system to SCSI persistent reserve commands to allow all of the multiple paths to register with the logical unit number of the shared storage system,” as recited in claim 1.

The Office Action alleges that Mark discloses that the fault tolerant system is an “open system.” However, “mapping open options” involves the mapping of available CPU operations that can be mapped to SCSI persistent reservations. The “mapping open options of the operating system to SCSI persistent reserve commands to allow all of the multiple paths to register with the logical unit number of the shared storage system” has nothing at all to do with “open systems” as intimated in the Office Action.

Marks also does not suggest that a second path accesses a shared storage system after obtaining a persistent reservation with the shared storage system. Rather, Marks discloses failover issues and how a surviving storage controller automatically assumes control of all

the host side SCSI IDs without obtaining any sort of persistent reservation when one of the storage controllers fails. Rather than allowing access to the LUN only after obtaining a persistent reservation, the storage controller in Marks automatically assumes control.

Therefore, Marks does not disclose or suggest all of the limitations of claim 1, and thus the Section 102 rejection with regard to claim 2 is improper and should be withdrawn.

2. CLAIM 2 IS PATENTABLE UNDER § 102(b) IN VIEW OF MARKS ET AL. (U.S. PATENT NO. 5,790,775)

Claim 2 is at least patentable over Marks for the reasons cited above because claim 2 incorporates all of the limitations of claim 1. However, claim 2 is patentable over Marks for additional reasons. Claim 2 requires that “the mapping open options of the operating system to SCSI persistent reserve commands to allow all of the multiple paths to register with the logical unit number of the shared storage system further comprises registering all paths from a first host with the logical unit number of the shared storage system using a single reservation key.”

However, Marks fails to mention anything about using a single reservation key. Moreover, Marks fails to mention using said single reservation key to register all paths from a first host with the logical unit number of the shared storage system.

As mentioned above, Marks fails to mention the use of SCSI-3 or persistent reservations. Rather, Marks merely performs failover without requiring a host CPU. Marks teaches that upon failure of one controller, a second controller assumes control of the SCSI IDs of the failed controller. Therefore, no reservations are involved. Moreover, a single reservation key is not used to register all paths from a first host with the logical unit number

of the shared storage system. Thus, absent a failure, the second controller is not capable, according to Marks, of accessing storage devices of the first controller.

Therefore, Marks does not disclose or suggest all of the limitations of claim 2, and thus the Section 102 rejection with regard to claim 2 is improper and should be withdrawn.

3. CLAIMS 3-4 AND 6 ARE PATENTABLE UNDER § 103 IN VIEW OF MARKS AS APPLIED TO CLAIM 1 ABOVE, AND FURTHER IN VIEW OF IBM'S SCSI COMMAND REFERENCE MANUAL

Claims 3 and 6 are at least patentable over Marks for the reasons cited above because claims 3 and 6 incorporate all of the limitations of claim 1. Furthermore, claim 4 includes all of the limitations 1 and 3. However, claims 3 and 6 are patentable over Marks for additional reasons.

Claim 3 requires “obtaining information about persistent reservations and reservation keys.” Claim 6 requires “issuing a persistent reserve out command for initiating an action with the logical unit number of the shared storage system.” However, as described above Marks predates SCSI-3 persistent reservations and further fails to even mention the use of persistent reservations.

The Office Action alleges that IBM's SCSI Command Reference Manual, at the bottom of page 3, suggests gathering information about a persistent reservation and reservations keys for a LUN. However, IBM's SCSI Command Reference Manual does not obtain information about persistent reservations and reservation keys. Rather, IBM's SCSI Command Reference Manual merely describes the use of persistent reservation in and persistent reservation out to allow failover to a second controller. Still further, IBM's SCSI Command Reference Manual does not issue a persistent reserve out command for initiating an action with the logical unit number of the shared storage system. As described above,

IBM's SCSI Command Reference Manual merely describes the use of persistent reservation in and persistent reservation out to allow failover to a second controller.

Therefore, Marks and IBM's SCSI Command Reference Manual, alone or in combination, do not disclose or suggest all of the limitations of claims 3 or 6, and thus the Section 103 rejection of claims 3, 4, and 6 is improper and should be withdrawn.

4. CLAIMS 23, 26-27, 29, 31, 34-35, AND 37 ARE PATENTABLE UNDER § 102(a) IN VIEW OF IBM'S SCSI COMMAND REFERENCE MANUAL

Claim 23 and 31 requires "mapping open options of the operating system to SCSI persistent reserve commands to process reservation keys to identify registered hosts and to process persistent reservation commands to control access by a host."

IBM's SCSI Command Reference Manual does not map open options of the operating system to SCSI persistent reserve commands to process reservation keys to identify registered hosts and to process persistent reservation commands to control access by a host. Rather, IBM's SCSI Command Reference Manual merely describes the use of persistent reservation in and persistent reservation out to allow failover to a second controller.

Therefore, IBM's SCSI Command Reference Manual does not disclose or suggest all of the limitations of claims 23 or 31, and thus the Section 102(a) rejection of claims 23 and 31 is improper and should be withdrawn.

Claims 26-27, and 29, and claims 34-35, and 37 depend from claims 23 and 31 respectively and are also patentable over the references, because they incorporate all of the limitations of the corresponding independent claims 23 and 31. Therefore, Applicants respectfully submit that dependent claims 26-27, and 29, and claims 34-35, and 37 are patentable over IBM's SCSI Command Reference Manual.

Therefore, IBM's SCSI Command Reference Manual does not disclose or suggest all of the limitations of claims 23, 26-27, 29, 31, 34-35, and 37, and thus the Section 102(a) rejection of claims 23, 26-27, 29, 31, 34-35, and 37 is improper and should be withdrawn.

5. CLAIMS 24 AND 32 ARE PATENTABLE UNDER § 102(a) IN VIEW OF IBM'S SCSI COMMAND REFERENCE MANUAL

Claims 24 and 32 are at least patentable over IBM's SCSI Command Reference Manual for the reasons cited above because claims 24 and 32 incorporate all of the limitations of claims 23 and 31 respectively. However, claims 24 and 32 are patentable over IBM's SCSI Command Reference Manual for additional reasons. Claims 24 and 32 require that persistent reservation commands are processed by allowing all of the multiple paths to register with the logical unit number of the shared storage system.

However, IBM's SCSI Command Reference Manual does not suggest that persistent reservation commands are processed by allowing all of the multiple paths to register with the logical unit number of the shared storage system. Rather, IBM's SCSI Command Reference Manual merely suggests how an initiator may make a reservation with a port target using persistent reserve in commands and to clear reservation of a target port using the persistent reserve out command. However, IBM's SCSI Command Reference Manual is completely silent concerning the ability for all paths to register with a LUN of the shared storage system. In fact, the discussion in paragraph 2 on page 23 of IBM's SCSI Command Reference Manual suggests that only one initiator may make a reservation with a target port and that only when an initiator having a persistent reservation with a target port has failed or is uncooperative may a second initiator take over for the failed or uncooperative initiator.

Clearly this is in opposition processing persistent reservation commands by allowing all paths to register with a LUN of the shared storage system.

Therefore, IBM's SCSI Command Reference Manual does not disclose or suggest all of the limitations of claims 24 and 32, and thus the Section 102(a) rejection of claims 24 and 32 is improper and should be withdrawn.

6. CONCLUSION

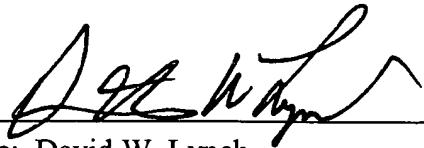
Therefore, for the reasons present above, Appellant respectfully submits that claims 1-38 are patentable over Marks and IBM's SCSI Command Reference Manual, taken alone or in combination.,

SUMMARY

Based on the above arguments, it is submitted that the rejections of the pending claims were erroneous, and allowance of all pending claims is requested. If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Attorney for Applicants, David W. Lynch, at 651-686-6633 Ext. 116.

Respectfully submitted,

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APPENDIX 1

THE CLAIMS ON APPEAL (as finally amended)

- 1 1. (Previously Presented) A method for providing access to a logical unit
2 number of a shared storage system when a hardware failure occurs in a first of multiple
3 input/output paths using a second of the multiple input/output paths, the method comprising
4 mapping open options of the operating system to SCSI persistent reserve commands to allow
5 all of the multiple paths to register with the logical unit number of the shared storage system
6 and allowing the second of the multiple paths to access the logical unit number of the shared
7 storage system after obtaining a persistent reservation with the shared storage system.

- 1 2. (Previously Presented) The method of claim 1 wherein the mapping
2 open options of the operating system to SCSI persistent reserve commands to allow all of the
3 multiple paths to register with the logical unit number of the shared storage system further
4 comprises registering all paths from a first host with the logical unit number of the shared
5 storage system using a single reservation key.

- 1 3. (original) The method of claim 1 wherein the mapping open options of the
2 operating system to SCSI persistent reserve commands further comprises obtaining
3 information about persistent reservations and reservation keys.

- 1 4. (original) The method of claim 3 wherein the obtaining information about
2 persistent reservations and reservation keys further comprises using a reservation in
3 command.

1 5. (original) The method of claim 4 wherein the reservation in command
2 comprises a read key service action and a read reservation service action.

1 6. (original) The method of claim 1 wherein the mapping open options of the
2 operating system to SCSI persistent reserve commands further comprises issuing a persistent
3 reserve out command for initiating an action with the logical unit number of the shared
4 storage system.

1 7. (original) The method of claim 6 wherein the persistent reserve out command
2 for initiating an action with a logical unit number of the shared storage system further
3 comprises a service action chosen from the group consisting of register, reserve, release,
4 clear, preempt and preempt with abort.

1 8. (original) The method of claim 7 wherein the register service action
2 comprises an add and a remove option.

1 9. (original) The method of claim 7 wherein the add option further comprises:
2 registering each path when configuring;
3 determining whether a first registration attempt was a success;
4 attempting a second registration attempt when the first registration attempt was not a
5 success, setting a state for the path as being dead when the second registration attempt is
6 unsuccessful and ignoring the path when the path has a state set to dead; and
7 setting a state for the path to true when the first or second registration attempt is
8 successful.

1 10. (original) The method of claim 7 wherein the remove option further
2 comprises:

3 determining whether a path has a persistent reservation;
4 issuing a persistent reserve out with service option release set when the path is
5 determined to have a persistent reservation; and
6 releasing the reservation when the when the path is determined to not have a
7 persistent reservation.

1 11. (original) The method of claim 7 wherein the reserve service action
2 comprises:
3 deciding whether a device needs to make a reservation to the logical unit number of
4 the shared storage system by examining whether a command parameter is set;
5 defaulting to a reserve required when a command parameter is not set and
6 implementing a persistent reserve to the logical unit number of the shared storage device
7 when no initiator has reserved the logical unit number of the shared storage device; and
8 when a command parameter is set executing the command parameter.

1 12. (original) The method of claim 11 wherein the command parameter is a
2 forced open option, the forced open option causing the device to read the current reservation
3 key, preempt and abort queued tasks when the current reservation key does not match the
4 device's reservation key.

1 13. (original) The method of claim 12 further comprising:
2 preventing reservations by setting the command parameter to no reserve;
3 determining whether the forced open completes successfully;
4 setting the device's reservation flag to the path index that made the reservation and
5 opening all paths with no reserve option set when the forced open command complete
6 successfully; and
7 issuing an error code when the forced open command does not complete successfully.

1 14. (original) The method of claim 11 wherein the command parameter is a retain
2 reservation option, the retain reservation causing the device to read the current reservation
3 key, determine whether a key is returned, establish that the logical unit number is not
4 reserved by an initiator and make persistent reservation when a key is not returned.

1 15. (original) The method of claim 14 wherein the retain reservation option
2 causes the device to determine whether a returned key matches a reservation key for the
3 device, to issue an error code when the returned key does not match the reservation key for
4 the device, and when the returned key matches the reservation key for the device open all
5 paths with a no reserve option set, set a reserve flag to the path index that made the
6 reservation, set the retain reserve to true and check a retain reserve field at close to determine
7 if persistent reserve should be released.

1 16. (original) The method of claim 11 wherein the command parameter is a no
2 reserve option, the no reserve option causing the device to read the current reservation key,
3 determine whether a key is returned, establish that the logical unit number is not reserved by
4 an initiator and opening all paths with original command parameter from a host.

1 17. (original) The method of claim 16 wherein the no reserve option causes the
2 device to determine whether a returned key matches a reservation key for the device, to issue
3 an error code when the returned key does not match the reservation key for the device, and
4 when the returned key matches the reservation key for the device issue a persistent reserve
5 out with release.

1 18. (original) The method of claim 11 wherein the command parameter is a
2 default reserve option, the default reserve option causing the device to check all paths,
3 determine whether any paths are unregistered, register all unregistered paths, ignoring any
4 paths that do not register successfully, return and read a reservation key, issuing an error
5 code when the returned reservation key does not match a reservation key of the device and
6 open all registered paths with no reserve set.

1 19. (original) The method of claim 18 wherein the default reserve option causes
2 the device when a key is not returned to select a registered path, issue a persistent reserve for
3 the selected registered path, ignoring the path if the persistent reservation is not successful,
4 and when the persistent reservation is successful marking a reserve field with the path index
5 that made the reservation and open all registered paths with the command parameter set to no
6 reserve.

1 20. (original) The method of claim 11 wherein the command parameter is a
2 single option, the single option causing the device to check all paths, determine whether any
3 paths are unregistered, register all unregistered paths, ignoring any paths that do not register
4 successfully, return and read a reservation key, issuing an error code when the returned
5 reservation key does not match a reservation key of the device and open all registered paths
6 with no reserve set.

1 21. (original) The method of claim 20 wherein the single option causes the device
2 when a key is not returned to select a registered path, issue a persistent reserve for the
3 selected registered path, ignoring the path is the persistent reservation is not successful, and
4 when the persistent reservation is successful marking a reserve field with the path index that
5 made the reservation and open all registered paths with the command parameter set to no
6 reserve.

1 22. (original) The method of claim 7 wherein the release service action
2 comprises:
3 closing all paths not reserved with a retain reservation option set;
4 opening a path with a retained reservation flag set; and
5 issuing a persistent reserve out command with a release service action set to release a
6 persistent reservation for a path.

1 23. (original) A method for supporting SCSI persistent reserve commands by a
2 shared storage system; comprising:
3 processing reservation keys to identify registered hosts; and
4 processing persistent reservation commands to control access by a host.

1 24. (Previously Presented) The method of claim 23 wherein the processing
2 of persistent reservation commands comprises allowing all of the multiple paths to register
3 with the logical unit number of the shared storage system.

1 25. (original) The method of claim 24 further comprising registering all paths
2 from a first host with the logical unit number of the shared storage system using a single
3 reservation key.

1 26. (original) The method of claim 23 wherein the processing reservation keys
2 comprises obtaining information about persistent reservations and reservation keys.

1 27. (original) The method of claim 26 wherein the obtaining information about
2 persistent reservations and reservation keys further comprises using a reservation in
3 command.

1 28. (original) The method of claim 27 wherein the reservation in command
2 comprises a read key service action and a read reservation service action.

1 29. (original) The method of claim 23 wherein the processing of persistent
2 reservation commands comprises issuing a persistent reserve out command for initiating an
3 action with the logical unit number of the shared storage system.

1 30. (original) The method of claim 29 wherein the persistent reserve out
2 command for initiating an action with a logical unit number of the shared storage system
3 further comprises a service action chosen from the group consisting of register, reserve,
4 release, clear, preempt and preempt with abort.

1 31. (original) A driver for mapping open options of the operating system to SCSI
2 persistent reserve commands, the driver configured to process reservation keys to identify
3 registered hosts and to process persistent reservation commands to control access by a host.

1 32. (Previously Presented) The driver of claim 31 wherein the driver
2 processes persistent reservation commands by allowing all of the multiple paths to register
3 with the logical unit number of the shared storage system.

1 33. (original) The driver of claim 32 wherein the driver registers all paths from a
2 first host with the logical unit number of the shared storage system using a single reservation
3 key.

1 34. (original) The driver of claim 31 wherein the driver processes reservation
2 keys by obtaining information about persistent reservations and reservation keys.

1 35. (Previously Presented) The driver of claim 34 wherein the driver
2 obtains information about persistent reservations and reservation keys by using a reservation
3 command.

1 36. (original) The driver of claim 35 wherein the reservation command comprises
2 a read key service action and a read reservation service action.

1 37. (original) The driver of claim 31 wherein the driver processes persistent
2 reservation commands by issuing a persistent reserve out command for initiating an action
3 with the logical unit number of the shared storage system.

1 38. (original) The driver of claim 37 wherein the persistent reserve out command
2 for initiating an action with a logical unit number of the shared storage system further
3 comprises a service action chosen from the group consisting of register, reserve, release,
4 clear, preempt and preempt with abort.